**Genetics Test – Part 1**

/45

**Multiple Choice (15 marks)**

Circle the best response AND place the CAPITAL letter of the correct answer in the margin.

1. Which term describes the passing of traits from parents to offspring?
   1. Polyploidy
   2. Non-disjunction
   3. Locus
   4. Heredity
2. What is the sex determination mechanism for mammals?
   1. Social structure
   2. Age
   3. XX/XY
   4. Temperature
3. Which term refers to a chromosomal abnormality in which there are three homologous chromosomes in place of a homologous pair?
   1. Zygote
   2. Trisomy
   3. Monosomy
   4. Tetrad
4. Which term describes the failure of homologous chromosomes to move to opposite poles of a cell during meiosis?
   1. Fragmentation
   2. Non-disjunction
   3. Crossing over
   4. Cytokinesis
5. What occurs during prophase I?
   1. Tetrads migrate toward the centre of the cell and align their centromeres across the middle of the cell.
   2. Homologous chromosomes move to opposite poles of the cell, and reduction division occurs.
   3. Chromosomes come together in homologous pairs; synapsis and crossing over occur.
   4. Nuclear membrane begins to form around the chromosomes at each end of the cell, and the cell begins to divide.
6. What occurs during metaphase I?
   1. Nuclear membranes begin to form around the chromosomes at each end of the cell, and the cell begins to divide.
   2. Tetrads migrate toward the centre of the cell and align their centromeres across the middle of the cell.
   3. Homologous chromosomes move to opposite poles of the cell, and reduction division occurs.
   4. Chromosomes come together in homologous pairs; synapsis and crossing over occurs.
7. Which term refers to non-sex chromosomes?
   1. Ova
   2. Autosomes
   3. Zygotes
   4. Gametes
8. An organism with a diploid number of 64 would produce gametes with \_\_\_\_\_\_\_\_\_\_\_ chromosomes.
   1. 32
   2. 16
   3. 64
   4. 8
9. In humans, a child’s sex is determined by:
   1. Its mother
   2. Its father
   3. Both parents
   4. Its autosomes
10. If an egg which, through non-disjunction, carries two sex chromosomes is fertilized by a normal sperm, the resulting zygote would be:
    1. XX or XY
    2. XXX or XYY
    3. XXX or XXY
    4. XO or YO
11. If a cell with 36 chromosomes undergoes mitosis, each daughter cell will have:
    1. 36 chromosomes
    2. 9 chromosomes
    3. 72 chromosomes
    4. 18 chromosomes
12. If the sequence of bases in one strand of DNA is AATCGG, what is the sequence of the complimentary strand?
    1. TTGCAA
    2. TTAGCC
    3. TTAGTT
    4. TTACGG

1

4

2

In the diagram above, the phosphate and sugar backbone of the DNA molecule can be identified as which of the following structures, respectively?

a. 1 and 3

b. 2 and 3

c. 4 and 2

d. 4 and 1

1. In the diagram above, the nitrogenous base cytosine would be represented by #2. Which structure would represent its complementary base

a. 2 b. 3 c. 4 d. 1

15. A cell in a human testis is undergoing meiosis. What is the sequence of the following events?

1. A cell division occurs without the duplication of chromosomes.

2. The chromosomes replicate in interphase.

3. Haploid cells are formed.

4. Without separation of the centromere, the chromosomes move to the poles of the cell.

5. The centromere splits and the chromosomes move to the poles of the cell.

a. 2, 4, 5, 1, 3

b. 1, 5, 4, 3, 2

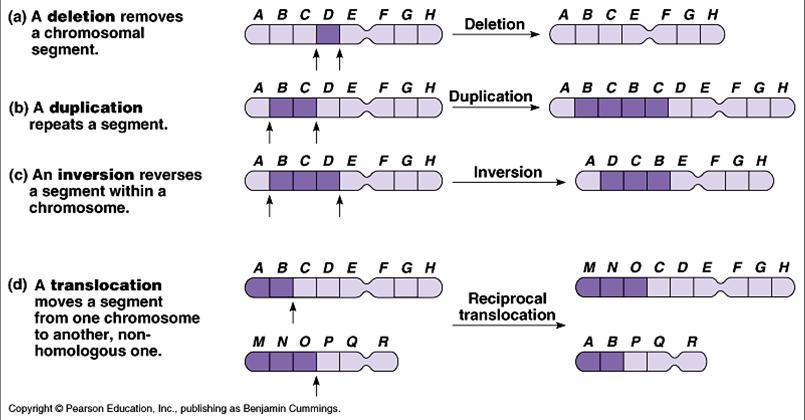
c. 2, 5, 1, 4, 3

d. 2, 1, 5, 4, 3

**Short Answer (30 marks)**

1. Neatly and clearly draw the cells described. (4 marks)
   1. A parent cell in prophase of mitosis (where 2n = 6)
   2. A parent cell in metaphase of meiosis II (where 2n = 6)
2. Examine the following diagram and determine the types of mutations that occur in DNA. List your answers in the space provided. (4 marks)

1



2

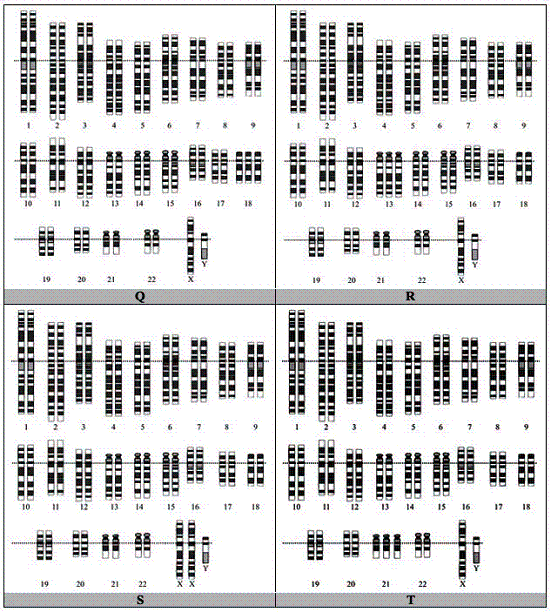
3

4

1. The somatic cells of a horse have 64 chromosomes. (3 marks)
   1. What is the diploid number for a horse?
   2. What is the haploid number for a horse?
   3. How many chromosomes are in a normal male horse gamete?
2. Turner syndrome is a sex chromosome abnormality. The affected person’s sex chromosomes would be XO.
   1. What is the gender of a person with Turner Syndrome? (1 mark)
   2. How many chromosomes would there be in the cells of a person with Turner Syndrome? (1 mark)
   3. For a person with Turner syndrome, is it possible to know which parent the abnormality originated? Explain. (2 marks)
3. How is it possible that only one egg is produced by females in meiosis? Why exactly is this necessary? Draw a diagram to aid in your explanation. (3 marks)
4. Draw a detailed diagram showing how it is possible for an individual to end up with trisomy. (3 marks)
5. A sequence of DNA is shown below. Show how each of the following types of mutations would affect the sequence by rewriting a sequence to include the mutation. For each answer, place a square around the mutation. (3 marks)

**GGTAATCGGATC**

* 1. Base-pair substitution –
  2. Deletion
  3. Insertion -

1. Choose one method of prenatal diagnosis technologies and explain in detail how they work. (2 marks)
2.  Examine the following diagrams:
3. Which individual (Q, R, S, T) has Klinefelter syndrome? Explain in detail how you know. (2 marks)
4. Which individual (Q, R, S, T) has Down Syndrome? How do you know? (2 marks)